T24-WSS

Wind Speed Sensor

User Manual
mantracourt.com

mantracourt

Wireless Telemetry Range 2.4Ghz

Introduction / Overview

The T24-WSS wireless anemometer is built on the same technology as previous Mantracourt wireless sensors interfaces offering the same sleep and wake functionality and operation with peripheral devices including handhelds, USB base stations and GPRS data loggers.

The Anemometer features a high quality 3-cup rotor pressed on a stainless steel shaft with rugged Delrin body with bronze Rulon bushings

The output value of the anemometer can be calibrated and configured to the user's requirements and measure over the range 5 to 125 mph.

Accuracy:

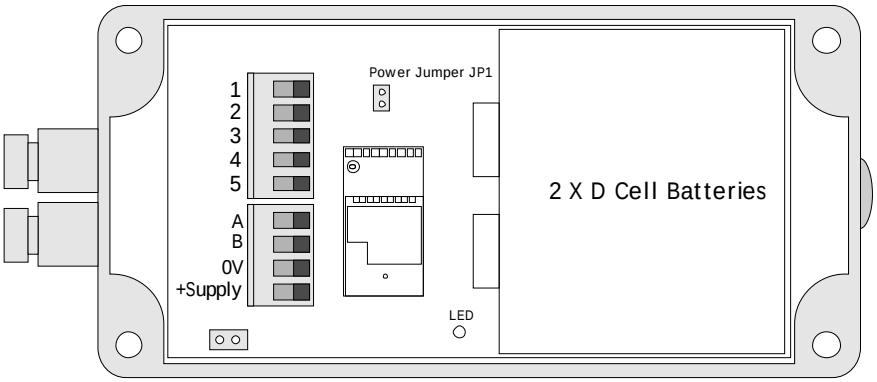
- 0.5mph from 5 to 10 mph
- ± 4% from 10 to 125 mph

The T24-WSS is powered either from internal batteries or an external supply. For applications which require high sampling rates for long periods Mantracourt's PowerPack1 and SolarPanel1 (PP1 & SP1) offers an ideal solution.

Getting Started

Connecting Power

Power can be supplied by fitting 2 X 'D' cell alkaline 1.5 Volt batteries or the module can be supplied from an external 5V to 18V DC source. The module will switch to the external supply in preference providing a battery back up.
In both cases you need to fit the JP1 power jumper to supply power to the acquisition module.
When powered from the external DC source the LED will illuminate.



Configuration

This section explains how to install software and configure the module. Please note that you will need the T24 Toolkit software and a T24-BS base station to allow your computer to communicate with T24 telemetry devices.

Installation

T24 Toolkit

To configure the devices we must use the **T24 Toolkit** software application. This can be downloaded from our web site or may be shipped with your products.
Install this on a PC or laptop.
Run setup.exe and follow the prompts to install the software.

T24-BSu Base Station

If you have a USB version of the base station (T24-BSu) then you just need to plug this into a USB socket on your PC. If you are using an alternative base station then please refer to the appropriate manual.

T24 Toolkit

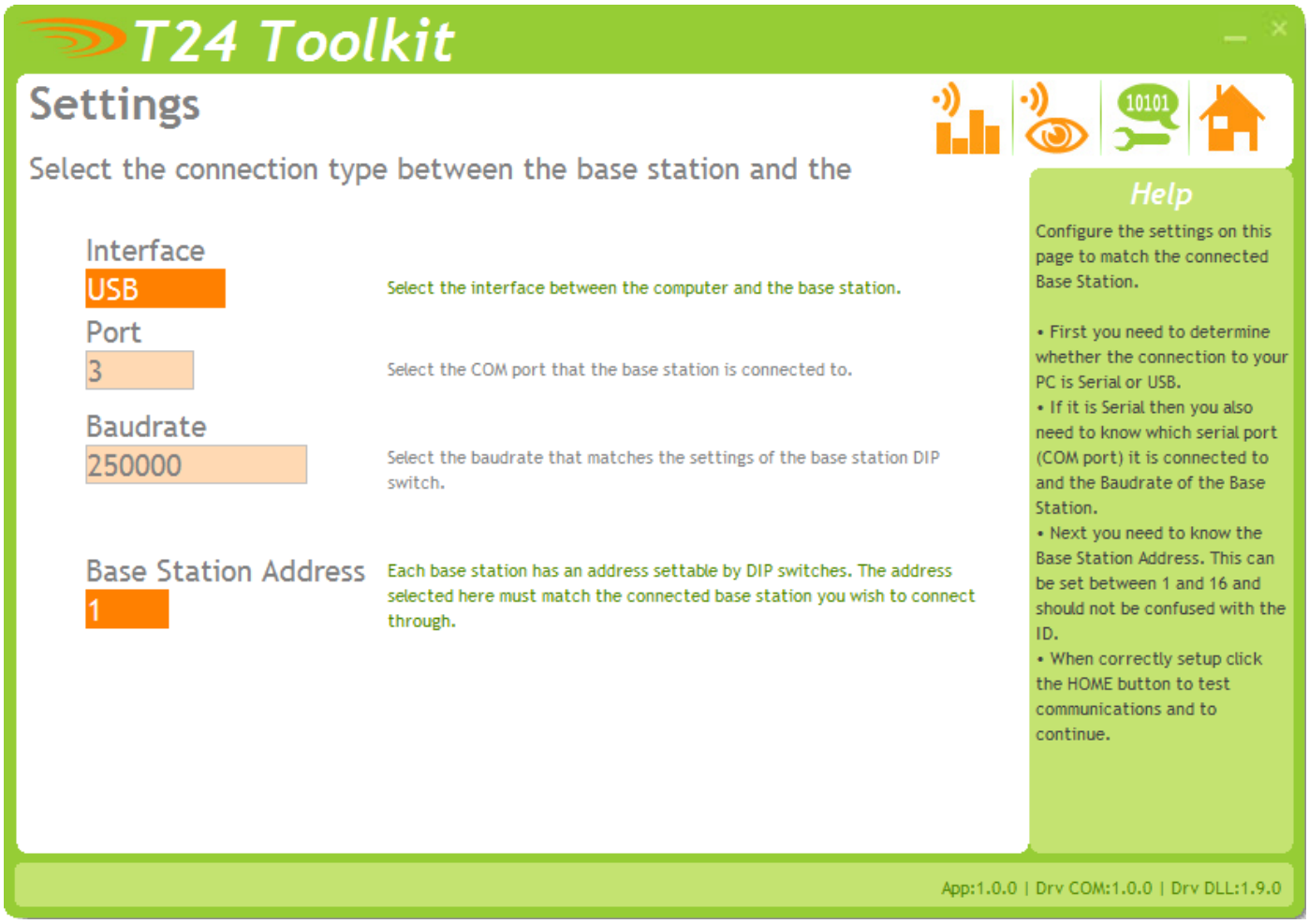
The T24 Toolkit provides a means of simple configuration and calibration of the acquisition module along with useful tools to aid integration.

Run the T24 Toolkit software application.

PLEASE NOTE: Depending on which acquisition module is selected the screenshots may vary slightly. This will generally be in naming of units and device descriptions. The screenshots shown are those shown when a T24-SA strain gauge acquisition module is connected.

General Pages

Setup Base Station Communications



Select **USB** as the interface and select 1 as the Base Station Address.
In the toolkit all items that can be changed by the user are coloured orange.
To change a value just click on the relevant orange item. You will then be presented with a new dialog window allowing you to change the value.
This may use a slider, text box or list to allow your new value to be entered.

Click the Home button to attempt communications with the base station.
If no communications can be established the toolkit will remain on this page. You will need to check that the base station is powered and that it is connected to the converter correctly.

Home

We now have successful communications with the base station so we can now pair with our device or we can select the Spectrum Analyser mode or Data Provider Monitor mode.

To connect to our device we will pair. This is achieved by power cycling the device. Pairing removes the need to know the radio settings of the device you are connecting to and also ensures that it is in a suitable state for configuration.

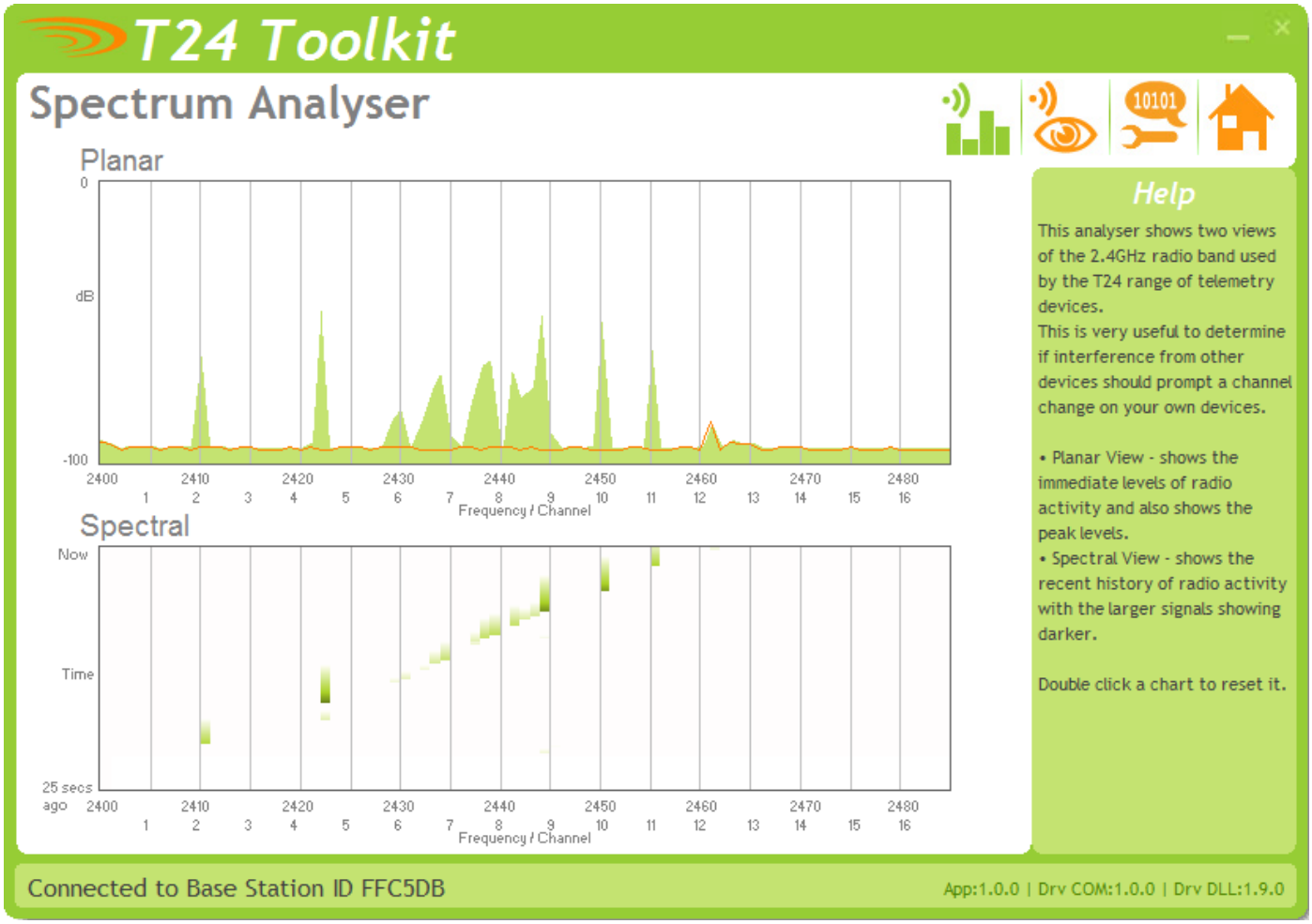
Pairing Procedure

- Remove power from the T24-WSS.
- Click the Pair button on the toolkit.
- You now have 10 seconds to re-apply power to the T24-WSS.

If you connect successfully the toolkit will change to the Information page.
If the pairing fails try again.

NOTE: Pairing with the toolkit will **not** change the radio configuration settings of the connected device.

Analyser

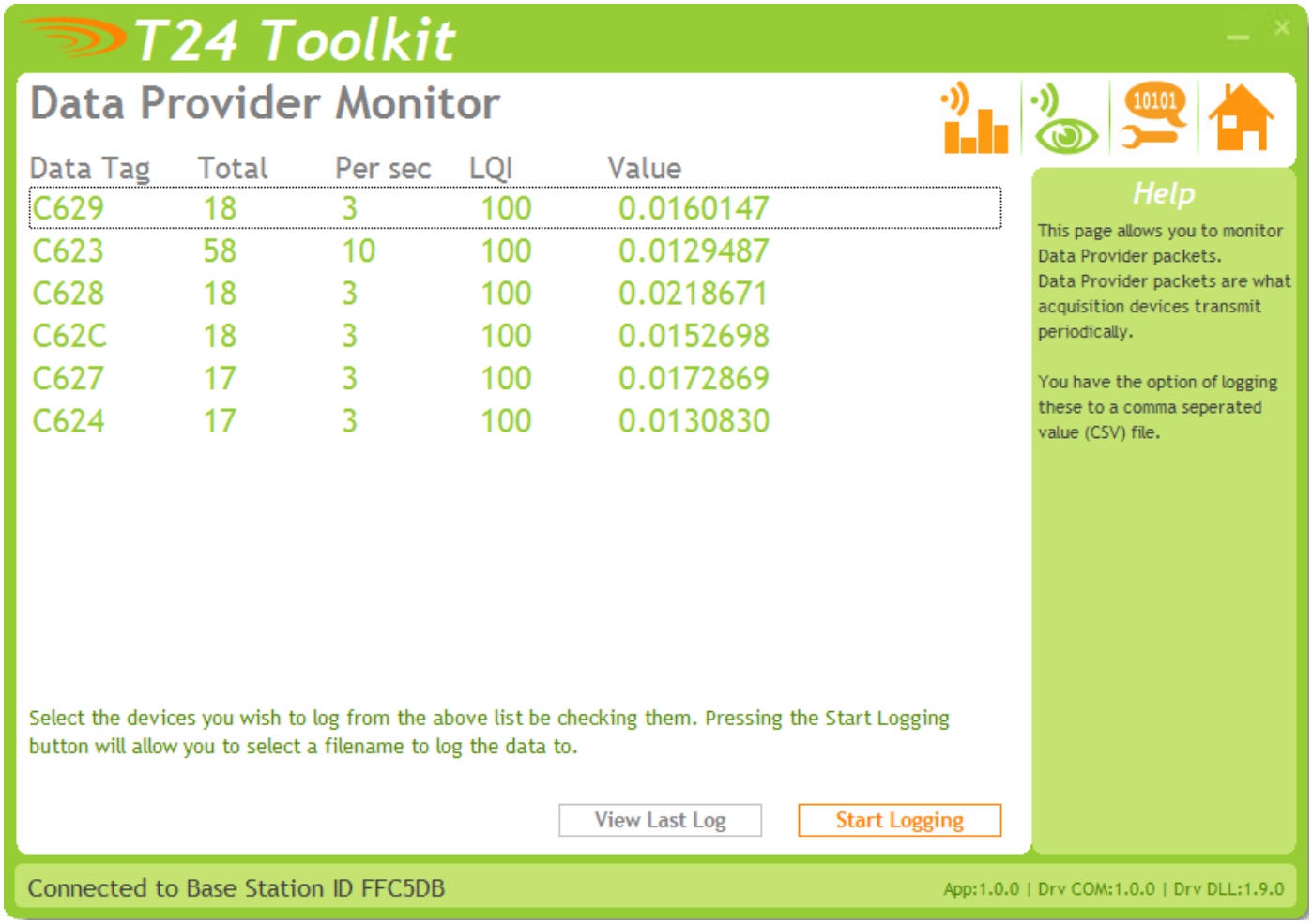


The analyser page is provided as a tool and will not normally be needed unless you plan to change channels and want to find the best channel to select, or to diagnose poor communications issues.

This page shows the radio signal levels detected across all the channels available to the T24 series of devices. Using this tool may help in detecting noisy areas and allow you to decide on which channels you may want to use.

The above charts show the traffic from a Wi-Fi network and it can be seen to be operating over channels 6 to 9 and it would be best (though not essential) to avoid using these channels.

Data Provider Monitor



T24 acquisition devices normally operate in low power mode and periodically transmit Data Provider packets
This page shows all detected Data Provider packets which may be useful for checking that a device is operational.

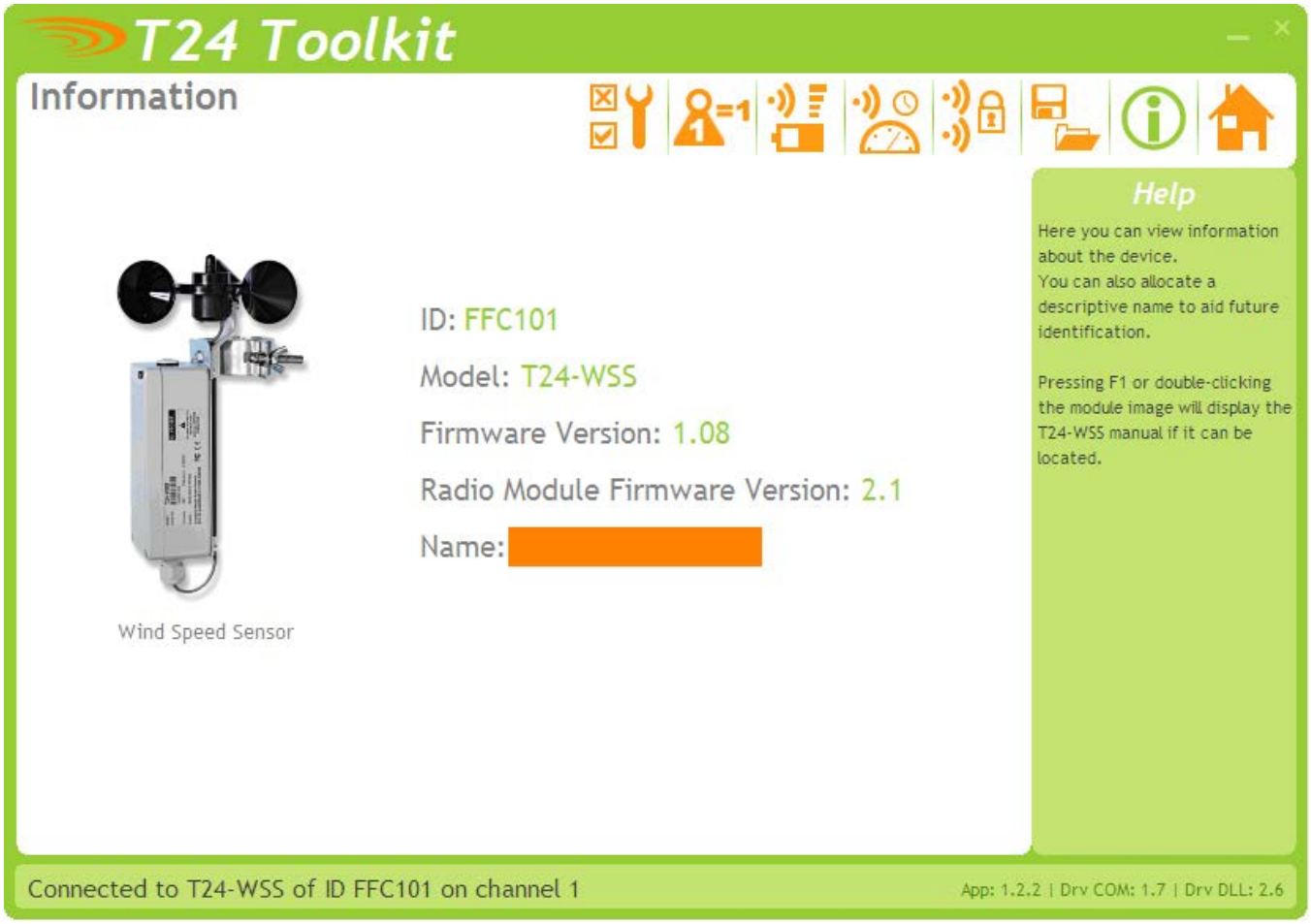
NOTE: When the toolkit connects to a device to enable configuration it will usually inhibit the transmission of Data Provider packets.

The Start Logging button will ask for a filename and proceed to log the received data to a CSV file in the following format:

```
Data Tag, Elasped mS, Value
```

The View Last Log button will launch the application associated with CSV files and open the last logged file.

Information

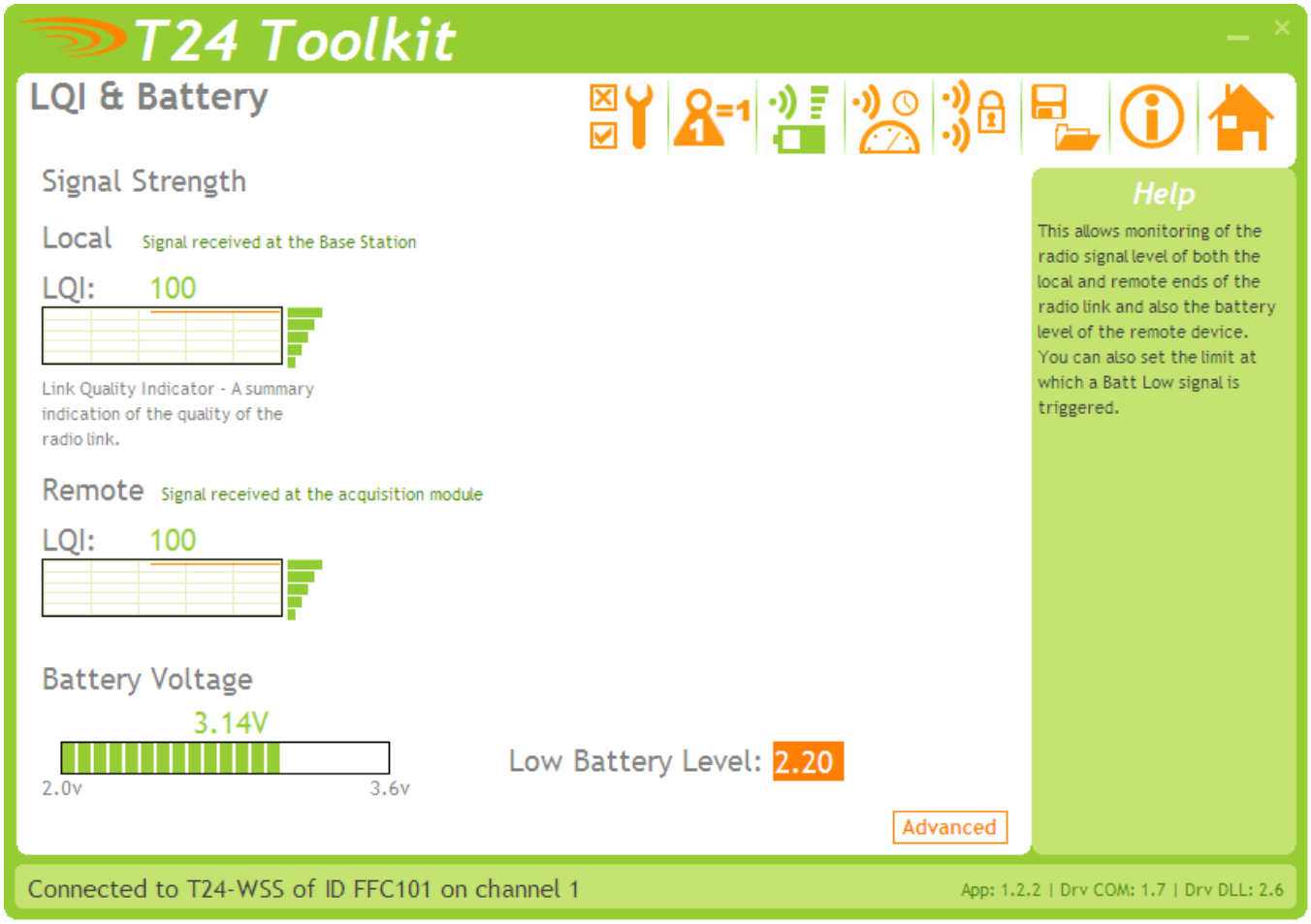


Once successfully paired to a device this page is displayed.
This page shows you information about the connected device. The T24-WSS is built around Mantracourt T24-PA Pulse Acquisition Module

Items you can change:

Name	You can enter a short description which may help you recognise this device in the future.

Battery and Radio Levels



Here you can see the voltage of the battery and the radio signal levels at the base station and the remote acquisition module. This simple view gives an LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable.

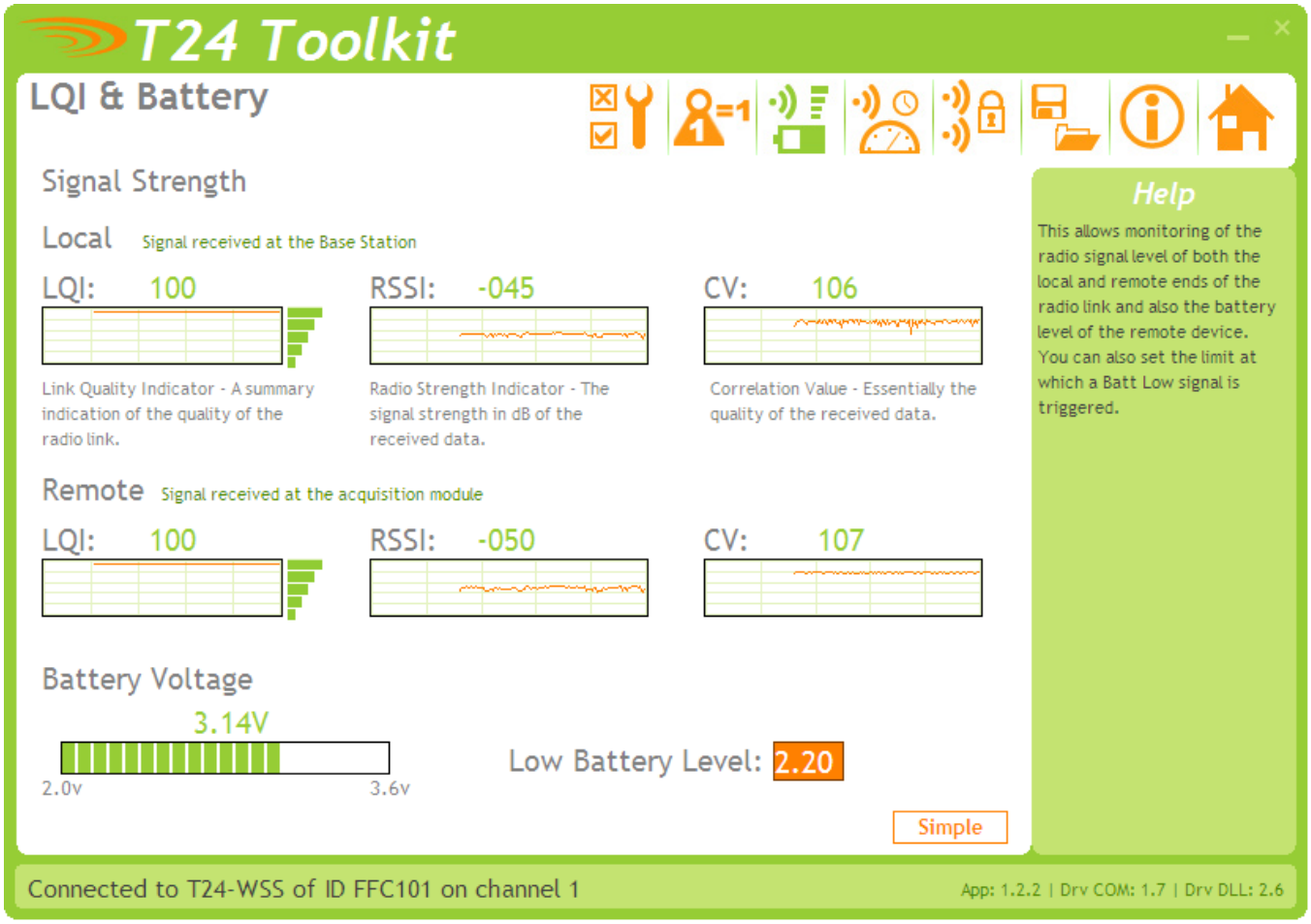
You can set the level at which the acquisition module reports a low battery.
If the battery voltage is below the Low Battery Level the bar will be coloured orange.

Items you can change:

Low Battery Level	Click this item to set the battery low level.

Clicking the Advanced button will give more detailed information on the RSSI and CV levels of the received radio packets.

Battery and Radio Levels Advanced Settings



LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable.

RSSI is effectively the received dB level which will range from about -30 which is a good signal to -90 which is a weak signal.

CV is the correlation value and indicates how well the signal can be decoded. This ranges from 55 which is a poor quality signal and 110 which is an excellent signal.

Data Rates and Quality

This page allows you to select the rate at which data is transmitted from the acquisition module and the quality. By selecting low power mode and entering some other information the toolkit will also give guides on achievable battery life.
Note that the battery life calculator is assuming the best case scenario which is at 20°C and that the battery has a suitable low internal resistance or that a suitable capacitor is fitted across the battery. See battery details in the Installation section.

Items you can change:

Transmit Interval

Enter the transmission rate in milliseconds. The default is 2000 giving a reading every two seconds. You may want increase this value to slow transmissions down to achieve longer battery life.

NOTE: In order to capture wind speed of 3.5 mph the Sample time must be 1000ms so the minimum TX interval is al 1000.

Sample Time

WARNING CHANGING THIS VALUE WILL EFFECT THE INPUT RANGE OF THE SENSOR
This is the length of time in milliseconds that the input is sampled before the value is transmitted. The default value is 1000ms allowing for wind speeds from 5 mph upward to be captured.

Low Power Mode

Unless the acquisition module is non battery powered this should be set to Yes. In between transmissions the acquisition module will enter sleep mode which, for some modules such as the strain gauge acquisition module, will have a massive effect on battery life.
A Reason for **not** using Low Power Mode would be if using the device in a

	Master-Slave arrangement with PC for example. Or if there is less than 40mS between the sample time and transmit interval.
Battery Type	This is not a parameter of the device but information used by the battery life guide. You can choose from some preset batteries or choose custom to allow you to select your own battery capacity. See below. This will also offer to change the Battery Low Level if the level suitable for the chosen battery is not the level currently set.
Usable Capacity	This is not a parameter of the device but information used by the battery life guide. This is the capacity of the battery in Amp Hours and has a profound effect on battery life calculations. This capacity needs to be calculated from battery manufacturer's data sheets to take into account that we can only use batteries down to 2.1 Volts so in the case of twin AA cells this would be 1.05 Volts. Generally the usable capacity will not be as high as that advertised by the battery manufacturer. Temperature and internal resistance of the battery are not taken into account in the guide.
Sensor mA from 5V Excitation	This is the current drawn by the sensor; this should be set to 2mA for the T24-WSS to provide a conservative battery life guide.
Usage Per 24 Hour Period	Enter the number of hours per 24 hour period that the T24-HS handheld will be turned on and communicating with an acquisition module.

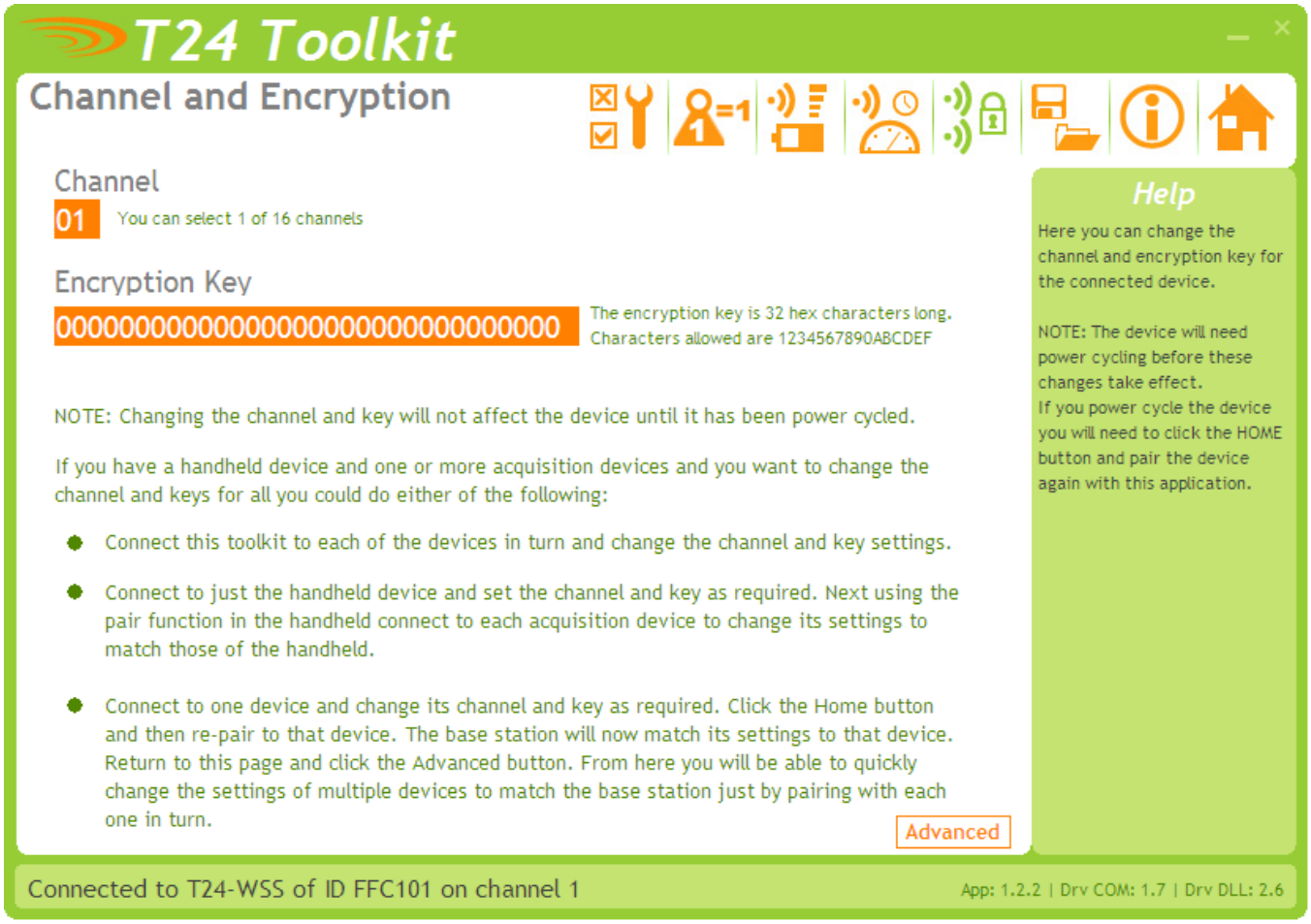
Units

Output Value is the live value of the current wind speed in the units selected above.

Items you can change:

Output Units	Simply select the required output units from the drop down list. The T24-WSS can provide wind speed in m/s , mph, km/h and fps

Channel and Encryption



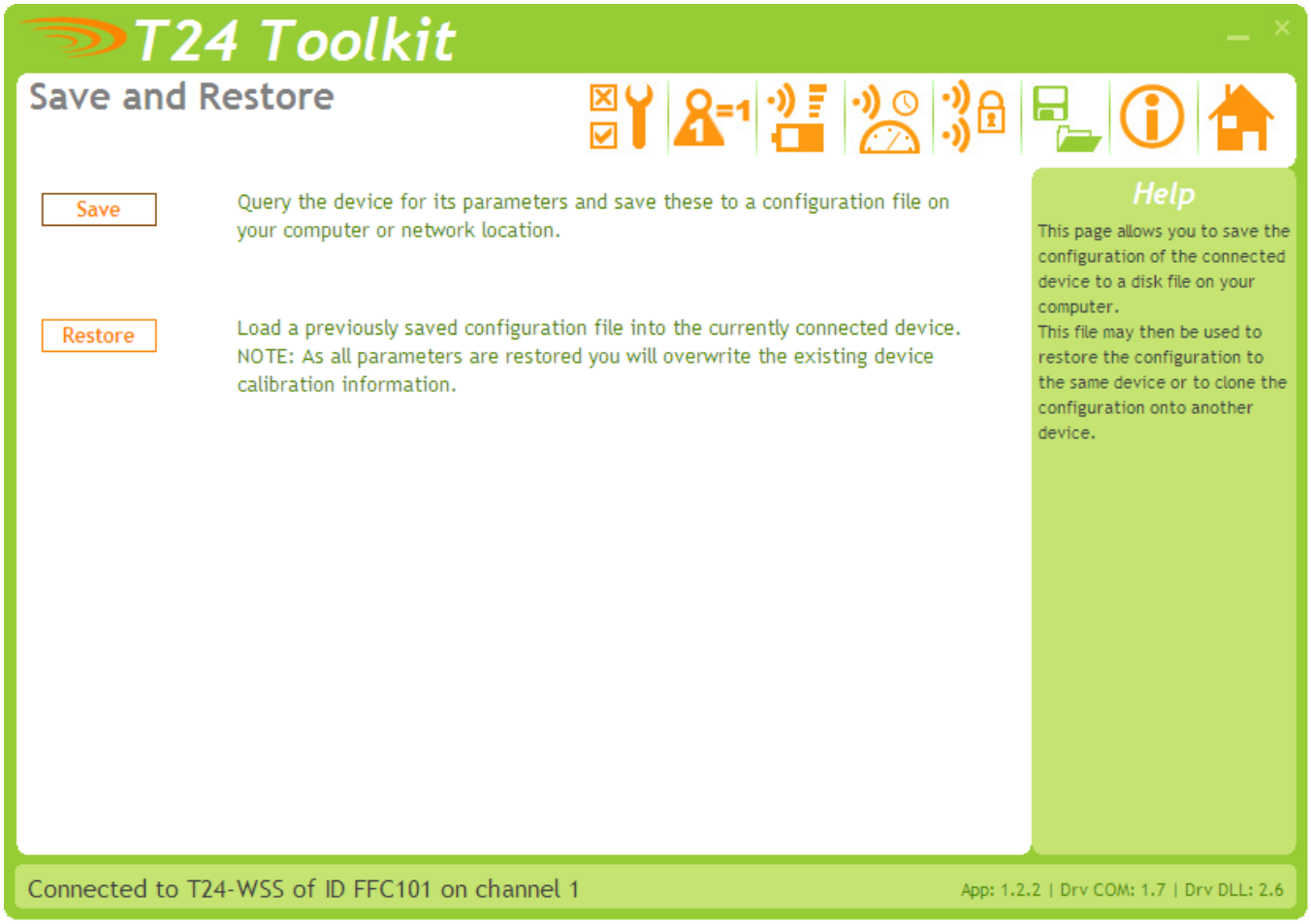
Here you can change the channel and encryption key for the acquisition module device.
If you want to change the channel of an acquisition module and T24-HS pair there is no need to change both devices.
Simply pair to the T24-HS handheld and change its channel and key.
Now perform pairing to the acquisition module from the handheld and the acquisition module will be configured to match the handheld.

NOTE: Early acquisition module do not yet utilise the encryption keys so these should be left at all zeros.

Items you can change:

Channel	Select a channel between 1 and 16. The default is channel 1. You can use the Spectrum Analyser mode to determine a good clean channel to use. NOTE: Channel 16 is used to negotiate pairing so avoid this channel if possible.
Encryption Key	Only devices with identical encryption keys can communicate. You can isolate groups of devices on the same channel or just use the key to ensure the data cannot be read by somebody else.

Save and Restore

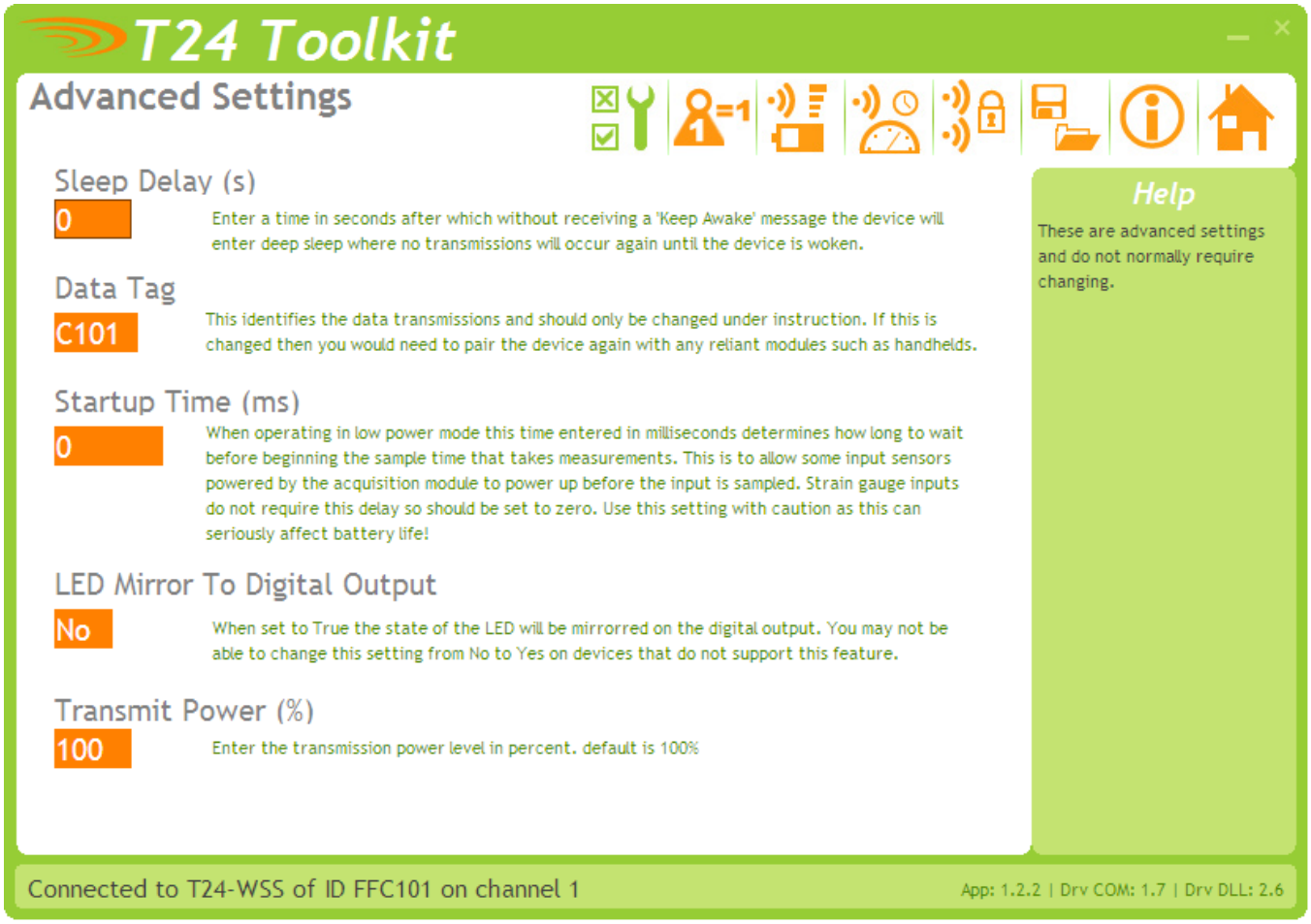


Here you can save the device settings to a file on your PC so that they can be later loaded back into the same or different device.

Items you can change:

Save	Click this button to open a file dialog window to allow you to select a filename and location to save the configuration file to. All configuration information including calibration data will be saved to the file. The file extension is **tcf**.
Restore	Click this button to open a file dialog window to allow you to select a filename and location of a previously saved file to load into the connected device. All configuration information **including** calibration data will be overwritten. The file extension is **tcf**.
Advanced Settings	Click this button to enter the Advanced Settings Page. Here are settings which do not normally require changing.

Advanced Settings



You should not normally need to change these settings.

Items you can change:

Sleep Delay	Here you can enter a delay in seconds after which the acquisition module will return to deep sleep if no Keep Awake message is heard from the T24-HS handheld. The default is 60 seconds.
Data Tag	The data transmitted by the acquisition module is marked with a Data Tag which is a 2 byte hexadecimal code. By default this is set to the last 2 bytes of the device ID (or to put it another way, the last 4 characters of the device ID). If by some chance you had two acquisition module devices that would be working on the same channel and had the same last 4 characters in their ID (1 in 65,535 chances) you may want to change the data Tag of one of the devices and perform pairing again with the T24-HS handheld.
Startup Time	Not applicable to this module.
LED Mirror to Digital Output	When set to Yes each time the LED is active the digital output is active. This can be useful if the module is to be encapsulated or enclosed and enables a second LED to be externally mounted. This is very useful when using a T24-HR roaming handheld as the acquisition module LED will activate while the handheld is in communications with the module.
Transmit power	Set the transmit power level from 0 – 100%. Default is 100%

Installation

Overview

Radio performance at microwave wavelengths is very dependent upon the operating environment; any structure within the operating region of the radios will give rise to three effects:

Obscuration. Obscuration will result in reduced range and occurs when an obstruction masks the line-of-sight between radios.

Aberrations to the horizontal and vertical space patterns. Distortion of these patterns may occur if structures or objects are placed in the near or intermediate field of the antenna. The effect will be to distort the coverage patterns, adversely affecting range and link quality.

Reflection. Any object placed in line-of-sight of the transmit antenna will result in signals arriving at the receiver by an indirect path. Degradation of performance due to reflection (multipath effects) appears as reduced range or poor link quality.

Any of the above will cause poor RSSI figures, an increase in the packet loss rate and in extreme cases complete loss of signal. Fortunately, if consideration is given to these effects at the integration stage then a good quality link will be obtained.

Guidelines for installation:
When planning installations ensure that line-of –sight between nodes is maintained and that objects or structures are kept at least one metre away from antennae wherever possible.

Specifications

General Radio

	Min	Typical	Max	Units
Licence		Licence Exempt		
Modulation Method		MS (QPSK)		
Radio Type		Transceiver (2 way)		
Data Rate		250		k bits/sec
Radio Frequency	2.4000		2.4835	GHz
Power		1		mW
Range			200 (650)	Metres (feet) *
Channels (DSSS)		16		

***** Maximum range achieved in open field site at a height of 3 metres above ground.

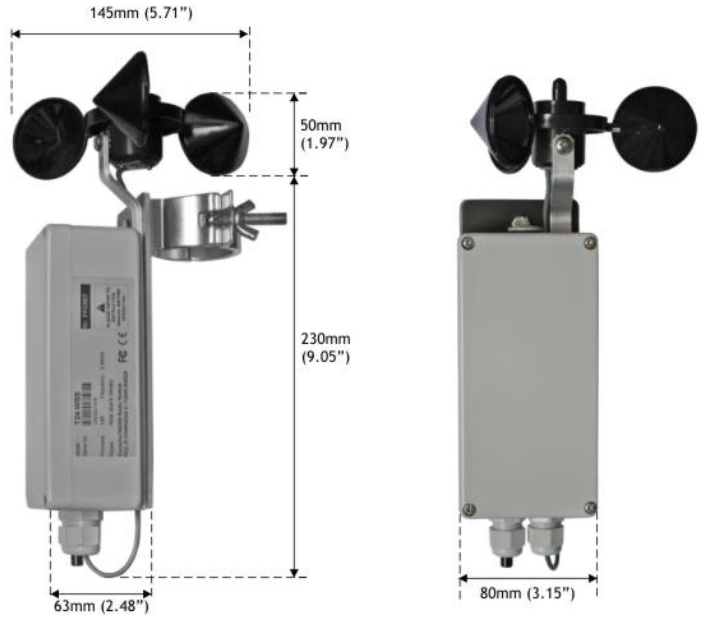
T24-WSS Specifications

Specification at 3V supply at 25°C

Parameter	Min	Typical	Max	Units
Battery Supply Voltage	2.1	3	3.6	V DC
External DC Supply	5		18	V DC
Operating Temperature Range	-20	-	55**	°C
Storage Temperature Range	-40	-	85	°C
Humidity			95	%RH
Reverse Polarity Protection		-	-32	V DC
Environmental protection with suitable cables exiting through cable glands.		IP65		
Measurement Range	5	-	125	mph
Accuracy 5 – 10 mph		0.5		mph
Accuracy 10 – 50 mph		±4%		mph

**Batteries used may have reduced operating temperature range.

Physical Dimensions



Approvals

CE

CE

Complies with EMC directive. 2004/108/EC
The Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive, 1999/5/EC,

European Community, Switzerland, Norway, Iceland, and Liechtenstein

English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Deutsch:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprecheneden Vorgaben der Richtlinie 1999/5/EU.
Dansk:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Directiv 1999/5/EF.
Español:	Este equipo cumple con los requisitos esenciales asi como con otras disposiciones de la Directive 1999/5/EC.
Français:	Cet appareil est conforme aux exigencies essentialles et aux autres dispositions pertinantes de la Directive 1999/5/EC.
Íslenska:	Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.
Italiano:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.
Nederlands:	Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.
Norsk:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-directiv 1999/5/EC.
Português:	Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.
Suomalainen:	Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.
Svenska:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

FCC

FC

Family: RAD24
Models: i and e for internal and external antenna variants. For antenna T24-ANTA and T24-ANTB
FCC ID:VHARAD24
This device complies with Part 15c of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION: If the device is changed or modified without permission from Mantracourt Electronics Ltd, the user may void his or her authority to operate the equipment.

Industry Canada

Industry Canada Industrie Canada

Models: i and e for internal and external antenna variants. For antenna T24-ANTA and T24-ANTB
IC:7224A-RAD24
This apparatus complies with RSS-210 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment RSS.

OEM / Reseller Marking and Documentation Requirements

FCC

The Original Equipment Manufacturer (OEM) must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents as shown:

> Contains FCC ID:VHARAD24
>
> This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
>
> (1) this device may not cause harmful interference and
>
> (2) this device must accept any interference received, including interference that may cause undesired operation.

The acquisition modules have been tested with T24-ANTA and T24-ANTB. When integrated in OEM products, fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Antennas other than T24-ANTA and T24-ANTB must be tested to comply with FCC Section 15.203 (unique antenna connectors) and Section 15.247 (emissions).

Acquisition modules have been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Changes or modifications not expressly approved by Mantracourt could void the user's authority to operate the equipment.

In order to fulfil the certification requirements, the OEM must comply with FCC regulations:
1. The system integrator must ensure that the text on the external label provided with this device is placed on the outside of the final product.
2. The acquisition modules with external antennas may be used only with Approved Antennas that have been tested by mantracourt.

IC

Labelling requirements for Industry Canada are similar to those of the FCC. A clearly visible label on the outside of the final product enclosure must display the following text:

> Contains Model RAD24 Radio (2.4 GHz), IC:7224A-RAD24

Integrator is responsible for its product to comply with RSS-210 - Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment RSS.

CE

The T24 series has been certified for several European countries.
If the acquisition module is incorporated into a product, the manufacturer must ensure compliance of the final product to the European harmonized EMC and low-voltage/safety standards. A Declaration of Conformity must be issued for each of these standards and kept on file as described in Annex II of the R&TTE Directive. Furthermore, the manufacturer must maintain a copy of the T24 device user manual documentation and ensure the final product does not exceed the specified power ratings, antenna specifications, and/or installation requirements as specified in the user manual. If any of these specifications are exceeded in the final product, a submission must be made to a notified body for compliance testing to all required standards.

OEM Labelling Requirements

The 'CE' marking must be affixed to a visible location on the OEM product.

The CE mark shall consist of the initials “CE” taking the following form:

- If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
- The CE marking must have a height of at least 5mm except where this is not possible on account of the nature of the apparatus.
- The CE marking must be affixed visibly, legibly, and indelibly.

Declaration Of Conformity

We, **Mantracourt Electronics Limited**
The Drive
Farringdon
Exeter
Devon EX5 2JB
declare under our sole responsibility that our products in the **T24 Radio Telemetry Product Range** to which this declaration relates are in conformity with the appropriate standard EN 300 328 following the provisions of the Radio and Telecommunications Terminal Equipment Directive **1999/5/EC**, **FCC CFR Title 47** part 15c BS EN 61000-4-2 and BS EN 61000-4-3 following the provisions of the EMC Directive **2004/108/EC** and Low Voltage Directive **2006/95/EC**.

December 2007

Brett James
Development Manager
Mantracourt Electronics Limited.

FCC ID:VHARAD24

CE

Worldwide Regional Approvals

Region	Product Conforms To
Europe	CE
USA	FCC
Canada	IC
Australia	To Be Determined
China	To Be Determined
Japan	To Be Determined

Important Note

Mantracourt does not list the entire set of standards that must be met for each country. Mantracourt customers assume full responsibility for learning and meeting the required guidelines for each country in their distribution market. For more information relating to European compliance of an OEM product incorporating the T24 range of modules, contact Mantracourt, or refer to the following web site: **www.ero.dk**

Warranty

All Telemetry products from Mantracourt Electronics Ltd., ('Mantracourt') are warranted against defective material and workmanship for a period of (1) one year from the date of dispatch.

If the 'Mantracourt' product you purchase appears to have a defect in material or workmanship or fails during normal use within the period, please contact your Distributor, who will assist you in resolving the problem. If it is necessary to return the product to 'Mantracourt' please include a note stating name, company, address, phone number and a detailed description of the problem. Also, please indicate if it is a warranty repair.

The sender is responsible for shipping charges, freight insurance and proper packaging to prevent breakage in transit.

'Mantracourt' warranty does not apply to defects resulting from action of the buyer such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorised modification.

No other warranties are expressed or implied. 'Mantracourt' specifically disclaims any implied warranties of merchantability or fitness for a specific purpose. The remedies outlined above are the buyer's only remedies. 'Mantracourt' will not be liable for direct, indirect, special, incidental or consequential damages whether based on the contract, tort or other legal theory.

Any corrective maintenance required after the warranty period should be performed by 'Mantracourt' approved personnel only.

Industry Canada
Industrie Canada

Designed, manufactured and supported in the UK

ISO 9001 REGISTERED FIRM

In the interests of continued product development, Mantracourt Electronics Limited reserves the right to alter product specifications without prior notice.

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Distribuidor

Brasil e América do Sul

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